

### **Abstract of the Disclosure**

A freely-rotating trackball for simultaneously detecting one, two, or three independent directions of its non-rotational displacement, and as many as three independent directions (roll, pitch, and yaw) of its rotation. In various implementations, non-rotational displacement of the trackball may be measured or interpreted as a widely-varying user interface parameter or as a discrete “click” event. Signal processing may be used to derive three independent rotation components (roll, pitch, and yaw) from more primitive sensor measurements of the trackball. The invention provides for trackball displacement and rotation to be sensed by a variety of sensing techniques including optical, magnetic, electromagnetic, capacitive, resistive, acoustic, resonance, and polarization sensor. The system may be used to provide an extended number of simultaneously interactive user interface parameters, and may itself be incorporated into larger user interface structures, such as a mouse body.